RECEIVED
DEC - 3
VET. MED. LIBRARY

OHIO STATE UNIVERSITY
DEC - 3 1959
LIBRARY

The Veterinary Record

PATRON: HER MAJESTY THE QUEEN

Vol. 71 No. 39 Issue No. 4251 819-838

A NEW EAR WAX REMOVER—

and remedy for parasitic mange in dogs and cats

TRIBUTES FROM A FIELD TRIAL

- "especially useful because of its property of dissolving wax".
- "often no cleaning with forceps and wool was necessary".
- "This product has been found to be exceedingly good also in certain ear conditions not readily curable".
- "Two main types responded best, namely, parasitic mange and accumulation and hardening of wax secretion causing irritation".

*Vet. Rec. 1959, 71, 143

CERUVET

(Trade Mark)

VETERINARY EAR DROPS

Particularly effective in parasitic mange and accumulation of hardened wax, especially in long-haired dogs.

- NO OTHER MEDICATION OR TREATMENT NECESSARY
- SAFE—NON-IRRITATING—ANTI-BACTERIAL
- EASILY APPLIED—HARMLESS TO THE LINING OF THE EAR

Supplied in 14 ml. vials with dropper

Literature gladly sent on request

LABORATORIES FOR APPLIED BIOLOGY LTD.

91, AMHURST PARK, LONDON, N.16 TELEPHONE: STAmford Hill 2252/3

Our ORIGINAL

CHLORAMPHENICOL AEROSOL

has proved its efficiency

It ensures a quick and deep penetration of the minute particles, and it is clean and easy to use. The inclusion of gentian violet acts as a marker.

Each unit of CHLORAMPHENICOL AEROSOL 10% contains sufficient material for 40 to 50 feet.

Available in cases of:

6 × 114 gramme units *and*
12 × 114 gramme units

SOMERSET PHARMACEUTICALS LTD
WELLINGTON SOMERSET - *Phone:* Wellington Som. 2244

The
VETERINARY RECORD

Founded by William Hunting, F.R.C.V.S., in 1888

7, MANSFIELD STREET, PORTLAND PLACE, LONDON, W.1. MUSEUM 6541

No. 39 NOVEMBER 14th, 1959 Vol. 71

Registered for Transmission as a Newspaper *Price 2s. post free*

Publications of the B.V.A.

IT may be recalled that, in his Presidential address to the Folkestone Congress Mr. Hebeler referred to "publications which now form such a large part of the Association's activities"; and at the annual banquet the guest of honour, Lord Waldegrave, having paid a gracious tribute to THE VETERINARY RECORD went on to mention the Association's proposed new journal *Research in Veterinary Science*. Our readers may be interested to learn of the progress in the preparations to publish this journal.

The uneasiness felt in some quarters that its creation might impoverish the content of THE VETERINARY RECORD is, so far, without foundation. More than enough papers to provide the first number have been accepted by the Editors, and work is coming in steadily without affecting the sustained volume of articles offered to the Association's official journal. Indeed, readers will have noticed that THE RECORD continues to grow in size; and there is no end yet in sight to that development. Interest in the new journal has been widespread. Enquiries about it have been received from many parts of the world, and prospective contributors from countries as far apart as the United States, Africa and Germany have asked for the pamphlet of directions to authors. Work from New Zealand and from the Sudan has already been accepted, in addition of course to papers from the University veterinary schools in Britain and several of the principal research institutes.

As a complement to the general assessment of papers made by the Scientific Editors and the members of the Editorial Board, it was decided to invite a number of scientists to assist the Board by acting as Readers in specialised disciplines. The following gentlemen have been good enough to accept this invitation.

Dr. F. Alexander, Dr. G. H. Arthur, Mr. F. D. Asplin, Mr. P. K. C. Austwick, Dr. F. R. Bell, Mr. J. D. Blaxland, Professor G. F. Boddie, Dr. R. S. Comline, Dr. R. J. Fitzpatrick, Dr. A. W. Gledhill, Dr. R. F. W. Goodwin, Dr. R. A. Green, Dr. Alastair Greig, Professor C. S. Grunsell, Dr. C. Horton-Smith, Professor J. S. S. Inglis, Dr. W. F. H. Jarrett, Dr. F. T. W. Jordan, Miss J. O. Joshua, Dr. A. S. King, Dr. J. O. L. King, Professor A. Laing, Mr. I. M. Lauder, Mr. D. D. Lawson, Dr. J. L. McGirr, Mr. D. R. Melrose, Professor A. Messervy, Mr I. H. Pattison, Mr. T. W. F. Pay, Mr. P. J. N. Pinsent, Dr. H. Platt, Mr. J. E. N. Sloan, Dr. H. Williams Smith, Dr. E. J. L. Soulsby, Dr. J. T. Stamp, Dr. E. L. Taylor, Professor W. L. Weipers, and Dr. J. E. Wilson.

The new journal, therefore, will benefit by the advice of an exceptionally powerful body of judges, and the Board is indebted to members of the Association of Veterinary Teachers and Research Workers, among others, for help in this connexion.

But the production of what it is hoped will be an acceptable first number is no more than the beginning of a beginning, and we can do no better than echo Mr. Hebeler's hope that "the venture will receive the warmest support from members of the profession both as contributors and subscribers."

In the meantime, as has been suggested above, THE VETERINARY RECORD continues to make progress in circulation, in the size and variety of its content, and in revenue. Many important pharmaceutical companies are taking an ever-increasing interest in veterinary medicine, and that interest is reflected in the frequency—and modern presentation—of their advertisements. It is possible to look well into next year with confidence; but suggestions from readers for new features, or for the improvement of present arrangements will be most welcome, either in the form of letters for publication, or as suggestions made directly to the Editorial Committee or the Editor. THE RECORD is the Association's own journal in addition to being a professional scientific publication; and a primary aim of those who are responsible for it is to provide that which redounds best to the credit of the B.V.A. and gives most satisfaction to the general body of readers within the framework of their membership of a learned profession.

This brief consideration of the literature provided by our Association would not be complete without reference to those handbooks for which standing committees, notably the Technical Development Committee, are mainly responsible. A great deal of work is being done. A handbook on meat inspection is with the printers; another, on tropical diseases, is well advanced; equine subjects, skin diseases in small animals, the treatment of cage birds and exotic domestic pets are among works in various stages of preparation.

None of these publications, whether journals or handbooks, would ever see the light of day without copious help, voluntarily given, of a host of authors, readers, arrangers, and technical and scientific advisers. Members of the B.V.A., and indeed the entire profession, are deeply in their debt.

Mixed Grazing and Nematodirus Disease of Lambs

BY

J. T. BAXTER

Veterinary Research Division, Stormont, Belfast

SUMMARY.—The results of a small-scale experiment indicate that mixed grazing of infected pasture by cattle and sheep will not prevent the lambs acquiring pathogenic burdens of Nematodirus worms. The danger is increased if the pasture is well grazed as the infective Nematodirus larvae are most numerous low on the herbage. Field experience confirms the view that even light set-stocking on infected pasture, if of sufficient duration, can be dangerous.

In Northern Ireland the peak of Nematodirus larval emergence on to pasture is in the period from the third week of March until the first week of April. The period during which grazing lambs are at risk consists of the months of March, April, and May. Successful prevention of nematodiriasis results from excluding lambs during the period of risk from pastures which were grazed by lambs in the previous year.

If medicinal agents are used in prophylaxis the first of a series of doses should be given in mid-March.

Introduction

IT has been considered that pastures infected with the larvae of parasitic helminths may be made less dangerous for susceptible animals if mixed grazing is adopted. The lessening of the risk is brought about by the non-susceptible members of the grazing group ingesting and digesting infective larvae on the herbage at a greater rate than they excrete infection. A small-scale experiment designed to study the application of this theory to Nematodirus disease of lambs was conducted at the Agricultural Research Institute of Northern Ireland during 1958.

Materials and Methods

Four paddocks, each of one-third acre, were stocked with 2 ewes and 4 lambs from March until July, 1957. The paddocks were known to be infected with *Nematodirus battus* and *Nematodirus filicollis* during 1956 and in 1957; clinically evident nematodiriasis occurred in 3, 4, 1 and 3 lambs in paddocks 1, 2, 3 and 4 respectively.

In 1958 the 4 paddocks were again stocked with Nematodirus-free ewes and their twin lambs from April 17. Paddocks 1 and 4 each had 2 ewes and 4 lambs while paddocks 2 and 3 each had 1 ewe and 2 lambs. Two calves also grazed on paddocks 2 and 3. For the first 2 days one calf was in each paddock but thereafter they were kept together. The dates on which the calves grazed the paddocks are shown in Table I.

Herbage examinations for Nematodirus infection were made from the beginning of the year and from March until the end of August they were occasionally made at fortnightly but more usually at weekly intervals. The methods described by Taylor (1939), Parfitt (1955), and Michel & Parfitt (1955) were used for collecting and examining the herbage samples. Faeces samples were obtained from the ewes, lambs, and calves and examined for worm eggs by the flotation method previously described (Baxter, 1958).

TABLE I
GRAZING RECORD OF CALVES A AND B ON PADDOCKS 2 AND 3 BETWEEN APRIL 17TH AND MAY 20TH

Dates Grazed	Paddock 2	Paddock 3
April 17th to 18th	A	B
April 19th to 22nd		AB
April 23rd to 26th	AB	
April 27th to May 7th		AB
May 8th to 13th	AB	
May 14th to 20th		AB
Calf-grazing Days	22	46

Results

The herbage samples were taken from the 4 paddocks as a whole and the results of examination for Nematodirus larvae are shown in Fig. 1. The numbers shown are the sum of *N. battus* and *N. filicollis*. The peak of Nematodirus larval emergence was during the last week of March and the first week of April. The level of herbage infection was declining when the paddocks were stocked on April 17th, 1958, but sufficient was present to give rise to Nematodirus disease in some of the lambs. The degree of clinical disease in the lambs is shown in Table II. Four lambs were in each paddock in 1957.

TABLE II
CLINICAL APPRAISAL OF THE LAMBS GRAZING THE INFECTED PADDOCKS

Paddock	1957 Clinical Cases	1958 Death	1958 Severe	1958 Mild	1958 No Signs	1958 Total Lambs
1	3	0	1	3	0	4
2	4	0	0	0	2	2
3	1	1	1	0	0	2
4	3	1	1	2	0	4

The 2 lambs in paddock 2 showed no clinical signs and examination of their faeces on 17 occasions during the experiment failed to reveal the presence of Nematodirus eggs; when one of the lambs was slaughtered on September 2nd, 1958, no Nematodirus worms were found. Lamb 3B in paddock 3 showed the first mild signs of illness on May 1st, 1958, became progressively worse and died on May 18th, 1958. Its twin, 3A, was first affected on May 9th, 1958, but recovered after passing through a severe attack of nematodiriasis.

On paddocks 1 and 4 the rates of stocking were

identical but the lambs were somewhat differently affected in that one died in paddock 4 on May 19th, 1958. In paddock 1 no deaths occurred although the degree of illness in the lambs was similar to that in paddock 4. As Gibson (1959) has indicated, minor anomalies are to be expected when in this type of work only small numbers of sheep are used. The results for paddocks 1 and 4 fall between those for paddocks 2 and 3.

Both calves became infected and passed *N. battus* and *N. filicollis* eggs in their manure. They were free of infection when first put on the paddocks.

Discussion

In paddock 3 one lamb died and the other was severely affected. This indicates that they acquired a dangerously large Nematodirus infestation when compared with the 2 lambs in paddock 2 which did not even become infected. The calves were, for the most part, in paddock 3 and, as a result, the herbage there was considerably shorter than in paddock 2. Additionally, the calves' faeces, which were loose, covered relatively large areas of the paddock and this reduced the available grazing area for the lambs. The lambs were compelled to graze even shorter the apparently clean part of the pasture. Observations made in previous years of the fluctuations in the Nematodirus larval population on pasture herbage, which was shortened by grazing or mechanical topping, indicated that these agencies brought about an increase in the number of larvae per lb. of remaining herbage. The increase is related, of course, to a given weight of herbage and not to the area involved. The graph (Fig. 1) illustrates the effect of grazing on a declining larval pasture population for, following stocking of the paddocks on April 17th, 1958, the numbers of larvae per lb. of herbage rose again. This second rise was followed by a decline until, on June 18th, 1958, the paddocks were mechanically topped and once again there was a temporary increase in the number of larvae recovered per lb. herbage. Spedding, Brown and Wilson (1958), from similar observations, have suggested that this indicates that the larvae tend to remain low on the herbage. It is for this reason that they consider infected pasture may be less dangerous to lambs if they graze it lightly only and if they are followed by ewes which may safely make use of the remainder.

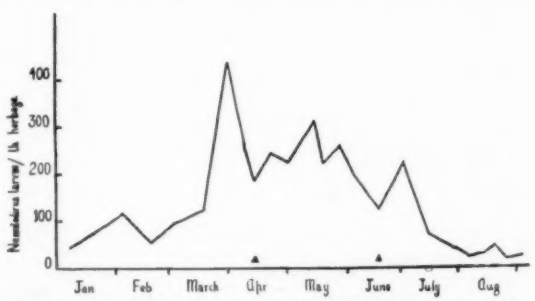

FIG. 1.—The effect of grazing and of mechanical topping on a declining Nematodirus larval population on pasture. Grazing commenced on April 17th and the paddocks were topped on June 18th.

The hypothesis that lenient grazing is safer than severe grazing seems to be substantiated by the present observations.

The evidence that most Nematodirus larvae are low on pasture herbage is circumstantial and their vertical distribution does not appear to have been studied although the variation in their horizontal distribution on pasture has been previously commented on by Spedding (1958) and Baxter (1958).

To elucidate this matter samples of herbage were taken from a field naturally infected with Nematodirus larvae. The growth consisted of mixed grasses varying in height from about 2 to 5 inches and forming a fairly dense sward. The grass was cut with scissors as close to the soil as possible while yet obtaining soil-free samples.

It was then cut into three lengths consisting of (a) the lowest inch, (b) the next lowest inch, and (c) the upper part. Each sub-sample was separately conveyed to the laboratory in a plastic bag. The sampling was repeated at 2 other areas in the field. On examination of the grass most of the larvae were found on the lowest part (Table III).

TABLE III
NUMBERS OF NEMATODIRUS LARVAE RECOVERED PER LB. OF HERBAGE

Area:	1	2	3
Grass sample	*Larvae per pound*		
(a) Bottom inch	44	32	60
(b) Next inch	28	16	28
(c) Upper part	16	0	0

Thus if lambs are compelled to eat very short herbage, as those on paddock 3 were, they are at greater risk than lambs eating longer herbage, as on paddock 2. This suggests that grazing by mixed species is not of itself likely to be helpful in controlling Nematodirus disease in lambs unless the stocking rates are very low. Furthermore, young cattle themselves become infected and augment the number of eggs being passed on to the pasture thus increasing the danger for the following year. In this matter the author assumes that as calves become infected with *N. battus* and *filicollis* of sheep origin so also may lambs be infected by larvae which have developed from the eggs of Nematodirus infections in calves. Both of the calves in the present experiment became infected with *N. battus* and *filicollis*. Other calves elsewhere in Northern Ireland have been found passing Nematodirus eggs or on *post-mortem* examination to be carrying Nematodirus worms, the species being *battus*, *filicollis*, and *spathiger*. These species have also been found in cattle in Great Britain, the most recently recorded being *N. battus* (Parfitt & Michel, 1958). *N. helvetianus*, observed in cattle in England by Morgan and Soulsby (1956) has not been recorded from cattle in this country, probably for the reasons set out by Rose (1959).

Reference has already been made to the suggestion that Nematodirus disease may possibly be controlled by light stocking and lenient grazing of infected pasture by lambs. Although the results of the small experiment described here suggest that light stock-

ing confers a degree of safety on the grazing lambs this is not borne out by field experience. Thomas and Stevens (1956) found that the average rate of stocking in the field outbreaks they investigated in N.E. England was one or two ewes and their lambs per acre. In Northern Ireland, outbreaks have occurred on good lowland pasture carrying one ewe and her lambs to the acre as well as on more heavily stocked fields. Before reliance can be placed on light stocking it is necessary to move the flock with sufficient frequency to provide them with grass of suitable length, as Spedding *et al.* (1958) have indicated. In the presence of Nematodirus herbage infection set-stocking at any level is potentially dangerous. This is so in Northern Ireland where many lowland sheep flocks lamb in time for the ewes to take advantage of the early growth of grass. The weather conditions favourable for early grass growth are associated with a subsequent hatching of the Nematodirus eggs which have overwintered on pasture. To become infected lambs need not graze the pasture at the larval peak period for observations made during 1957 to 1959 have shown that lethal infections may be acquired even as the herbage larval numbers are becoming less. Where sheep form a relatively small part of the total livestock, where they move round a considerable part of the farm especially in the second quarter of the year and where, as the result of crop rotations including leys, fresh grazing is made available to them, then Nematodirus infection although present is of no great practical importance. It has also been obvious that where any one of these factors has not operated, the risk of Nematodirus disease has increased as low-grade infection is fairly widespread in the country.

The number of sheep being kept on lowland farms is increasing and the acreage ploughed is decreasing each year. These two factors may account for the apparent increase in the number of outbreaks of Nematodirus disease occurring in Northern Ireland. However, increasing awareness of the presence of the disease in the country may also be important in bringing further outbreaks to light. Investigation of outbreaks of scour in groups of lambs, aged 3 weeks to 3 months, which did not die but exhibited varying degrees of illness, has clearly revealed that what has previously passed as a "spring grass scour" is often Nematodirus disease. The fact that not infrequently the ewes are also passing very loose faeces at this time may confuse the issue but observations over a number of years show that the ewes remain healthy and gain weight while the lambs lose weight and condition. In this circumstance it is reasonable to assume that the looseness of the ewes' faeces is the result of a physiological process dictated by lactation and related to their increased consumption of lush herbage and also, possibly, of drinking water.

It is generally agreed that the simplest practical method of controlling Nematodirus disease is to prevent lambs from grazing infected fields in the danger period. This has been successfully done here as elsewhere. Infected fields are those which were grazed by infected lambs during the spring and summer of the previous year. Hoggets may also excrete sufficient infection in the later months of a year to render a field unsafe the following year (Kingsbury, 1956). The eggs which have overwintered on pasture tend to hatch during a limited period of time in the following spring. In Northern Ireland the peak periods of larval emergence have been the third week of March, 1957, the last week of March and the first week of April, 1958, and the third week of March, 1959. To avoid significant infections the danger period should be regarded as including all of the month of March, April, and May. Although a small number of lambs still show signs of illness and a few die as late as June, they have acquired their infection much earlier with their flock mates but unlike them they do not appear to resist the effects of the infestation and thus are also possibly more susceptible to intercurrent infections. A few recover too slowly to be fattened in their first year and have to be overwintered as hoggets but most of the lambs which are affected make an apparently complete clinical recovery by late May or early June.

Because of the earlier peak of larval emergence in Northern Ireland compared with some areas of England, recommendations which have appeared (Black *et al.*, 1958; Scarnell & Rawes, 1959) regarding the prophylactic use of drugs, have to be altered to suit the local conditions. Irrespective of the location of the outbreaks within Northern Ireland the first signs of nematodiriasis usually appear from the last few days of March until mid-April. Accordingly the writer recommends, where clean grazing is not available, that prophylactic treatment should be started in mid-March and repeated twice at intervals of 3 weeks. The lambs will be protected until the end of April and on most farms outbreaks of Nematodirus disease will thus be prevented. The lambs may later acquire a low level of infection. Occasionally, however, later outbreaks have taken place with the first clinical signs and deaths occurring in early May. When the grazing history of such flocks and farms is investigated it has been found that the lambs have been moved, about mid-April, from clean fields to fields which were grazed by lambs during the previous spring and summer. On some farms where the disease is known to occur but where insufficient clean grazing is available to provide for the flock for the whole of the danger period combinations of grazing management and prophylactic treatment may be employed. In some outbreaks of the late type one dose of bephenium embonate given about mid-May has proved a curative treatment whereas in earlier outbreaks more than one dose has been required, if the flock has not been moved to clean land. A field observation of this nature is supporting evidence for the opinion that in Northern Ireland the danger period terminates about the end of May.

Acknowledgments.—I wish to thank Professor H. G. Lamont for helpful advice and guidance and Professor J. Morrison, together with the staff of the Agricultural Research Institute of Northern Ireland, for co-operation, advice, and the ready provision of facilities. Thanks are also extended to Mr. S. P.

(*Concluded at foot of col.* 1 *overleaf*)

Lymphosarcoma of the Thymus of a Young Cat

BY

K. G. MORGAN

Chepstow

SUMMARY.—A case of lymphosarcoma of the thymus and mediastinal lymph nodes occurring in an 8-month-old neutered male, long-haired cat, is described.

Introduction

AN 8-month-old black, long-haired neutered male cat was presented at the surgery on March 9th, 1959, with a history of vague oesophageal discomfort for 5 to 7 days. March 9th was the first day of signs of partial obstruction with immediate vomition of eagerly accepted food. At this time, and in fact, right up until the end, the animal was playful, lively and extremely hungry.

Clinical Examination

Examination revealed an oval shaped enlargement on the right side of the trachea, just below the larynx, there was then a space of apparently normal neck and then a second mass, a little to the right of the mid-line and almost obliterating the entrance to the thorax. At the time of examination, the animal readily ate small pieces of meat without much difficulty and did not vomit.

The animal was anaesthetised with pentobarbitone sodium gr. 1 per c.c. intravenously, in order to carry out a more detailed examination. It was found possible to pass a large gum elastic sound down the oesophagus and into the stomach, although considerable difficulty was experienced in passing the enlargement at the chest entrance. A grave prognosis was given to the owner and the suggestion was made that, although the animal was relatively young, it was quite possible that a rapidly growing neoplasm was the cause of the trouble. Alternatively, the swellings might possibly be of an infective nature and it was decided to try antibiotic treatment for the next 5 days to see if this would make any radical change in the condition. No improvement was seen however, and the animal's ability to swallow and retain food varied considerably from day to day, and even from hour to hour. At this time, occasional attacks of noisy dyspnoea indicating partial tracheal obstruction were becoming increasingly frequent.

On March 18th, as no improvement had ensued, it was decided to carry out an exploratory operation in order to determine the nature of the swellings.

The cat was anaesthetised with pentobarbitone sodium intravenously, restrained with the head in extension, and a long incision made, slightly right of the mid-line and directly over the two enlargements. It immediately became obvious that the condition was neoplastic and inoperable, and the animal was destroyed at once.

Post-mortem Examination

Post-mortem examination showed well developed neoplasia in the neck, entrance to the thorax (causing considerable displacement and compression of both trachea and oesophagus), this tumour having a smaller portion inside the chest attached to the floor of the sternum, and a larger lobe occupying a large portion of the mediastinum. Early metastases could be seen in the substance of the liver, in the kidneys and scattered in the mesentery.

The affected organs were removed for histological examination, and sent to the Department of Veterinary Medicine at Bristol University.

Laboratory Report

Macroscopical

The thymic tumour showed a homogeneous pinkish white appearance of the cut surface whilst the sternal and mediastinal lymph nodes presented a paler but still homogeneous surface.

The kidneys showed small white spherical areas up to 2 to 3 mm. diameter in the cortex and the liver similar areas of infiltration in the substance.

Histological

The thymus showed replacement of the normal structure by cells of the lymphoblast type intermixed with which were a small number of more normal small lymphocytes. Numerous mitoses were present (Fig. 1).

The sternal lymph node showed a somewhat similar picture though the predominant cell type was less differentiated and resembled more a primitive reticulum cell (Fig. 2).

Change in the mediastinal lymph node was not as

Mixed Grazing and Nematodirus Disease of Lambs —*Concluded.*

Rodgers, Mr. M. Croskery, and Mr. J. O'Hagan for technical assistance.

References

BAXTER, J. T. (1958). *Res. Exp. Rec. Min. Agric. N.I.* **7.** 147.
BLACK, W. J. M., THOMAS, R. J., & GREASLEY, J. (1958). *Brit. Vet. J.* **114.** 470.
GIBSON, T. E. (1959). *Ibid.* **115.** 120.
KINGSBURY, P. A. (1956). Personal communication.
MICHEL, J. E., & PARFITT, J. W. (1955). *Vet. Rec.* **67.** 229.
MORGAN, D. O., & SOULSBY, E. J. L. (1956). *Ibid.* **68.** 1,029.
PARFITT, J. W. (1955). *Lab. Practice.* **4.** 15.
———, & MICHEL, J. E. (1958). *Vet. Rec.* **70.** 71.
ROSE, J. H. (1959). *Ibid.* **71.** 470.
SCARNELL, J., & RAWES, DEIRDRE A. (1959). *Ibid.* **71.** 163.
SPEDDING, C. R. W. (1958). *Agriculture.* **64.** 480.
———, BROWN, T. H., & WILSON, I. A. N. (1958). *Vet. Rec.* **70.** 229.
TAYLOR, E. L. (1939). *Parasitology.* **31.** 473.

far advanced, there being faint evidence of the presence of lymphoid nodules (Fig. 3).

The affected areas of the kidney showed extensive interstitial invasion by cells of a type similar to that seen in the thymus (Fig. 4), but in the liver infiltration was less marked. In this latter organ areas of infiltration were centred both in the portal tract and in the substance of the lobule (Fig. 5).

Discussion

The relatively high incidence of tumours involving lymphatic tissues in the cat has been referred to by Cotchin (1957) and by Holzworth and Nielsen (1955). In both cases the authors refer to the involvement of structures in the anterior mediastinum which in some cases at least suggests a thymic origin. It seems to be generally accepted however that such tumours are not true thymomas but lymphosarcomas whether or not their site of origin is the lymphoid tissue of the thymus or in a lymph node.

The case described would certainly fall into the lymphosarcoma class. It emphasises the view of Cotchin (*loc. cit.*) that such tumours may occur in very young animals, and that affected animals may adapt themselves to their presence until the condition is far advanced.

Acknowledgment.—I am greatly indebted to Mr. A. D. Osborne, M.R.C.V.S. of the Department of Veterinary Medicine at Bristol University for the laboratory report and photomicrographs.

References

COTCHIN, E. (1957). *Vet. Rec.* **69.** 425.
HOLZWORTH, J., & NIELSEN, S. W. (1955). *I.A.V.M.A.* **126.** 26.

AMENDMENT SUGGESTED TO WARBLE FLY ORDER

A proposal that the Warble Fly (Dressing of Cattle) Order should be amended has been put by the agricultural committee of the County Councils Association.

This would permit the use on farms of the new systematic drugs, in field experiments supervised by veterinary inspectors of the Ministry of Agriculture. This would be as an alternative to the treatment prescribed in the order.

The idea follows a letter from the Ministry referring to field trials carried out by the Central Veterinary Laboratory. Although the department was satisfied that the preparations were effective in greatly reducing the number of warbles, and that the new methods of protection against warble fly needed only one dose or dressing during the winter months, these drugs were toxic in meat and milk.

The letter said manufacturers had agreed to issue instructions for their use making it quite clear they should not be administered to lactating cattle or to animals within 60 days of slaughter.

It added that the use of these drugs would not affect the existing obligation of owners to dress cattle with derris where they were visibly infested with warbles.

A Convulsive Syndrome in Sheep

BY

F. G. CLEGG

Veterinary Investigation Centre, Sutton Bonington, Loughborough, Leics.

SUMMARY.—A convulsive syndrome was responsible for severe losses in a self-contained sheep flock during the autumn of 1957. A similar condition affected lambs on the same pasture in the following autumn. The history of the outbreak, the alarming clinical signs, and the histopathology are described. The similarity of the condition to the recorded descriptions of convulsive ergotism in ruminants in other parts of the world is discussed. The possible relation of this condition to a hypovitaminosis A is suggested.

History

LOSSES were experienced in the autumn of 1957 in a breeding flock of cross Lincoln Longwools in North Lincolnshire. The first deaths occurred in the middle of August and losses continued until the first week in October, when they suddenly ceased. Deaths during this period amounted to over 30 sheep in a flock of 120. Some 10 or 12 lambs were affected and are included in this total of deaths. Accurate records were not kept by the farmer and carcases littered the hedges for several months. Two lambs died in similar circumstances when grazing part of the same field in late September of the following year.

The flock was grazing a poor pasture seeded the previous spring with what the farmer admitted was a very cheap commercial rye grass mixture. Half of this area was undersown to barley, and after the barley was harvested the sheep had access to the whole area of some 30 acres. The herbage was very poor, with widely scattered grass plants. No ragwort was found on the pasture and no other known poisonous plants were found. Ticks had been found on the dogs on rare occasions but had not been noticed on the cattle or sheep. The only recent additions to the flock were 2 Suffolk rams bought in the late autumn of 1955. Before this series of deaths there had been no illness in the flock other than in one of the rams which had died in the spring of 1956 from an undetermined cause. A flock of 60 lambs again grazed this field continuously during August and September of 1958.

Clinical Syndrome

Two live lambs were brought to the Veterinary Investigation Centre at Sutton Bonington in early September, 1957. A clinical examination suggested that they were affected with tetanus. The lambs were recumbent and would occasionally kick most violently with all 4 legs, after which the limbs would be apparently stiffened and held in spasm until the next period of excitement. The head in each case was retracted sharply in opisthotonos and it was considered that there was a degree of trismus. An

K. G. MORGAN—LYMPHOSARCOMA OF THE THYMUS OF A YOUNG CAT

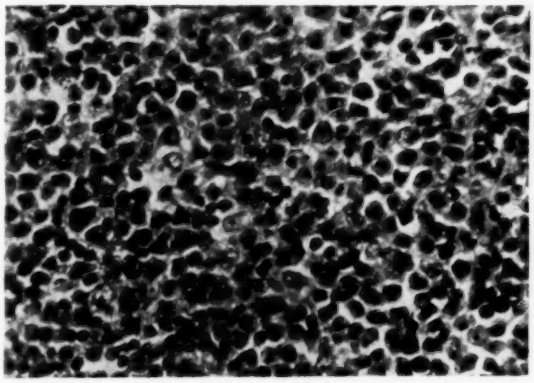

FIG. 1.—Thymus showing mainly cells of the lymphoblast type with very few of the small lymphocyte type. Several mitotic figures are seen. (H + E × 800.)

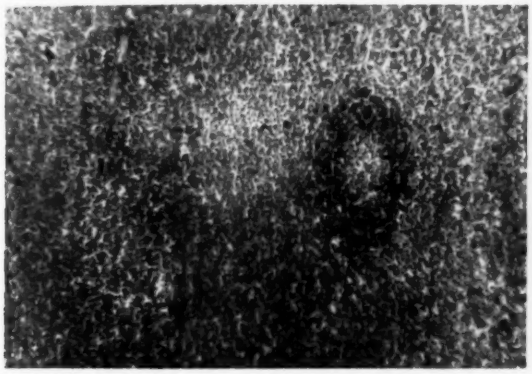

FIG. 3.—Mediastinal lymph node showing lymphoid centre. (H + E × 126.)

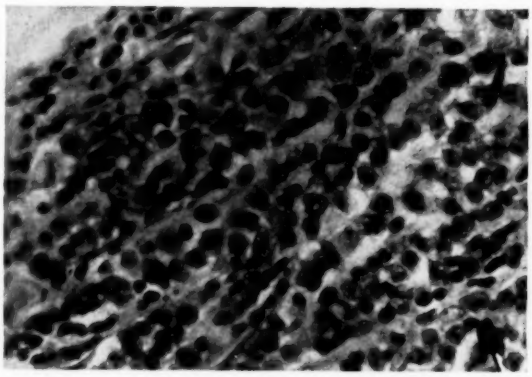

FIG. 2.—Sternal lymph node showing cells of a slightly more primitive appearance than in the thymus. (H + E × 800.)

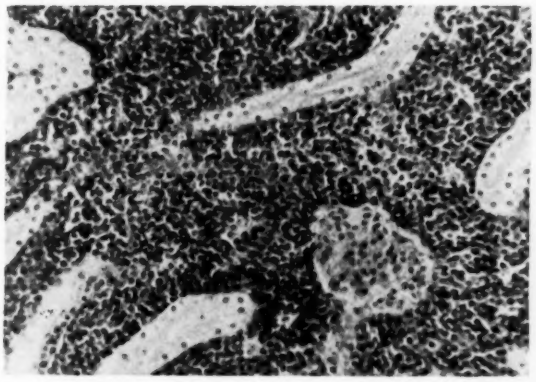

FIG. 4.—Kidney showing interstitial infiltration of tumour cells. (H + E × 320.)

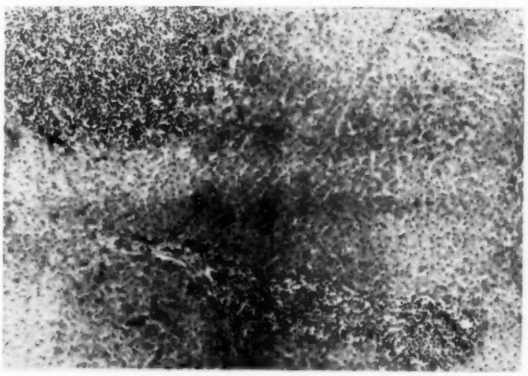

FIG. 5.—Liver showing two centres of tumour cell infiltration, one in the lobule and the other around the portal tract. (H + E × 126.)

examination for the presence of puncture wounds in the feet or for nicks sustained in crutching was negative, and the rather unsatisfactory diagnosis of "idiopathic" tetanus was made. The use of toxoid was suggested but it was learnt later that, despite its use, losses were continuing steadily. A visit was made to the farm and another sheep, a ewe, was found to be clinically affected. At this time it was realised that the diagnosis of tetanus was probably incorrect. An examination of the ewe showed that when the legs were extended in spasm the joints could be flexed more easily than in those typical cases of tetanus seen in lambs, following docking or castration. The ewe was afebrile and considerably distressed. The owner described most alarming signs in the cases which he had seen before they became recumbent. He described sheep rushing wildly at and through hedges, and also one ewe which, according to his description, leapt vertically into the air for several feet. The clinical picture could be summarised as one of exceptionally violent muscular spasms with the animal fully conscious, followed by periods of quietness and reduced alertness. The general condition of the whole flock was poor, most of the ewes appearing unthrifty. The condition of the lambs grazing the pasture the following year was slightly better. Two lambs died after showing a similar convulsive syndrome.

Every clinically affected animal died. Some of the ewes lived for as long as 3 days, gradually becoming weaker until death followed.

Necropsy

Post-mortem examination of the first 2 lambs examined did not reveal any lesions. Unfortunately no examination of the central nervous system was made of these cases. A detailed examination of the brain and spinal cord was made in other cases seen. On removing the brains they were found to be firm and one in particular was so firm that it gave the impression of a block of soap rather than of normal brain tissue. When the length of the spinal cord was exposed in 2 of the lambs, the dura mater was seen to be a violent purple red colour.

No gangrenous lesions or necrosis of limbs or ears were ever seen, either in living sheep or in animals which had died.

Histology

The examination of nervous tissues was carried out by the Pathology Department of the Central Veterinary Laboratory at Weybridge. In the first brain examined there was a non-purulent meningoencephalitis, essentially of the grey matter, which was disseminated and occasionally necrotising. Sections of the second brain showed more severe lesions of a disseminated non-purulent meningitis and moderate degeneration in a myelinated tract in the thalamus and mesencephalon. In both brains there was perivascular and pericellular oedema in the cerebral cortex, and degeneration of cerebellar Purkinje cells. Sections of the cords of the same 2 animals showed in one case a massive meningeal hyperaemia, and in the other an acute fibrinous meningitis. Clostridial organisms were seen in the sections of the cords but these probably were associated with a slight delay in removing the cords from the carcases.

Sections of the brain of one of the lambs dying in 1958 showed lesions essentially of a necrotising encephalopathy involving the cerebral cortex. These changes were limited to the dorso-lateral gyri of the frontal lobe and the areas were of irregular shape and with poorly defined borders. Many of the neurons in these areas were shrunken, disintegrated or absent but inflammatory reaction was hardly noticeable. A few lymphocytes and monocytes were seen in the underlying white matter, and in some parts of the meninges. Microglial reaction was mild and diffuse and there was an increase in vascular elements due to an apparent proliferative response of capillaries. The nerve fibres of the underlying white matter appeared widely separated and thinned. In the other parts of the brain, perivascular oedema was prominent with occasional extravasation of red blood corpuscles. In the cerebellum, the Purkinje cells of several folia appeared damaged or necrotic.

Diagnostic Procedure

Material from the first clinical case visited at the farm was examined for evidence of louping-ill. No virus was demonstrated from either glycerol-preserved or untreated brain, and histological examination of the medulla and cord showed no evidence of louping-ill. Bacteriological examination of the brain and cord proved negative, as did cultures of the same material which had been retained in the refrigerator for 24 hours.

Early in the investigation the possibility was considered of the existence of Borna disease, or the condition described in sheep as enzootic encephalitis by Moussu and Marchand, and considered by Nicolau and Galloway (1928) to be akin to Borna disease. This condition is manifested by severe nervous signs with restlessness and attacks of excitement and rigidity and paresis of limb muscles.

Attempts to transmit the condition to lambs by intracerebral inoculation of a suspension of brain material gave negative results.

After the failure of these transmission experiments the possibility of ergotism was considered and in January, 1958, a search was made of the old pasture. Sclerotia are usually cast from the grass heads after the first frosts and rough weather of early winter. One single sclerotium was found in a dried head of rye grass and was identified as *Claviceps purpurea* by Dr. T. Nicolson, of Nottingham University School of Agriculture. A heavy infestation may disappear from a pasture within 48 hours in late autumn, as recorded by Edwards (1953). It is interesting to note that this series of losses stopped

abruptly after the first week of October in the first year, and late in September in the second year of occurrence.

A detailed examination of the field was made in August, 1958. One half of the field had been sown with barley and a small strip of oats. Early in August it was found that many heads of indigenous cocksfoot, which then stood some 2 ft. above the barley, were heavily infected with ergot, showing all stages from the honey dew appearance to the presence of small sclerotia. Timothy and rye grass in the hedges were found to be affected also. A visit to the field in the middle of August showed that the barley was similarly infected. Infection was mainly confined to the edge of the crop and in a small area, that was within easy reach, some 5 or 6 affected heads could be seen. Occasionally a head would show the presence of two sclerotia. Many sclerotia were quite large, exceeding 1.5 cm. in length. By this time the sclerotia in the cocksfoot were also becoming long and spur-like. The orginal rye grass pasture, that is the half of the field undersown in 1957, showed an extremely heavy infestation, and practically every inflorescence showed the presence of one or more sclerotia. The sclerotia of the barley were examined for their alkaloid content by Dr. S. Wilkinson of the Wellcome Research Laboratories and were found to contain 0.857 per cent. total alkaloid, which is an extremely high value. Values of 0.1 per cent. or 0.2 per cent. total alkaloid are described for imported Spanish or Portuguese ergot. Paper chromatography showed that the major constituents were ergotamine, ergocornine and ergometrine, with traces of ergocristine and ergokryptine. This appears to be a usual alkaloid composition of ergot.

On examination for the presence of ergot alkaloids in the liver and in the contents of the abomasum of the last lamb to die from the condition in 1958, Dr. Wilkinson reported that extracts gave spots on the paper in a position corresponding closely to the one found with ergotamine and gave the blue colour characteristic of indole alkaloids on spraying with dimethylaminobenzaldehyde. Only minute quantities were present and the possibility of the presence of indolic compounds other than ergot alkaloids could not be ruled out. Vitamin A estimation of the liver of this same lamb gave a value of only 6.5 I.U. per gramme of liver. This is a low value as figures of the range of 400 to 600 I.U.s per gramme have been described in the livers of grazing sheep.

Discussion

So far as can be ascertained convulsive ergotism has not been described in animals in Great Britain. This form is known to occur in sheep and cattle in France (Guilhon, 1955), Italy (Carlevaro, 1956), Portugal (Frazao, 1956), California (Dillon, 1955), the Middlewest of the U.S.A. (Anon, 1945), and in Florida (Simpson & West, 1952).

Guilhon (1955) states that ergotism of carnivora, horses and sheep is nearly always convulsive, but that this form is rare in cattle. He refers to a description by T. O. Heusing in 1770 where the sheep were fed with rye straw and grain screenings. The sheep are described as having jumped the walls of a pen and of having shown convulsions. Lambs and ewes died in large numbers. Guilhon also quotes a description by Traube of an outbreak in Hanover, in which a heavy ergot infection was considered responsible for losses in sheep pastured in a rye field after the harvest. Guilhon states that in animals dying from the convulsive form, *rigor mortis* is never complete, the muscles remaining flaccid while the arteries are empty. The first sign in convulsive ergotism is vertigo, the animal staggering as if intoxicated. It then loses its balance and falls, appearing drowsy for a few minutes before rising to its feet again. These manifestations persist and are interrupted by convulsions of the limbs or of the whole body. These general convulsions are characterised by epileptiform attacks, the muscular spasms being followed by a temporary paralysis of the hind quarters and the animal appears drowsy. Guilhon states that animals may show their distress by crying out and it is noted that the coat loses its lustre.

Latour (1955), describing the severe outbreak of ergotism at Pont-Saint-Esprit, states that during the clinically latent period in man, rapid deaths were occurring in domestic animals which were fed with the contaminated bread. After eating the bread the animals became drowsy, and showed muscular spasms. Gabbai, Lisbonne and Pourquier (1951) dealing with the same outbreak stated that it was easy to incriminate the bread as responsible, as animals which ate this died after making convulsive movements. In describing the human illness they mention the formications and the cramp of the calves of the leg. The severe muscular spasms recalled those seen in tetanus but they seemed to be less sustained and less painful. Four of the 25 convulsive patients died in muscular spasm.

Dillon (1955) described convulsive ergotism in calves at pasture which showed no evidence of the gangrenous form. When first examined the calves were trembling violently, and after moving them, one of the calves showed a stilted gait before leaping in the air and then falling exhausted.

Carlevaro (1956) states that the convulsive form of ergotism with sudden death between tetanic crises is more common in pigs than cattle, and that in sheep, the condition is even more acute, for the animals may drop dead without any previous symptoms.

No recent description of the histopathology of the human central nervous system following convulsive ergotism has been found. Guilhon (1955) describing the pathology of the convulsive form in animals states that there is hyperaemia of the meninges and that sections of the brain show "stippling" as an indication of anaemia. Similar changes are described in the spinal cord. Kaunitz (1931) found in experimental ergotism in fowls that while the arteries near the base of the comb were contracted, the capillaries

were markedly dilated and contained stagnant blood. According to Hutyra, Marek and Manninger (1949) myelitis has been caused in South Africa by feeding paspalum grass infected with ergot.

The two distinct types of human ergot poisoning, convulsive and gangrenous, are well known in European history. Epidemics of the convulsive form were more common east of the Rhine and the gangrenous form predominated to the west (Barger, 1931). Various explanations of this different action have been put forward; difference in the active principle of strains of ergot, the ingestion of continuous small amounts compared with a more acute poisoning and differences in the nutritional status of the affected patient. It has been suggested that a low vitamin A intake in the diet may be the additional factor which tends to allow the convulsive form (Mellanby, 1931a). In another article Mellanby (1931b) described the striking improvement in the clinical condition of animals affected with severe convulsive ergotism when vitamin A or carotene was fed, and in an earlier article (1930), he recalled the unsuccessful attempts that had been made to produce the condition. Mellanby considered the general clinical and experimental evidence to be so strong that he suggested that the disease could be treated and prevented in this way. Barger (1938) maintained that ergot alkaloids themselves would not produce severe convulsive symptoms in man, and that some other factor is necessary.

Rojdestvensky (1927) considered that the conditions favouring the spread of ergot, were a rainy spring followed by a dry sunny interval just at the time of the grass flowering and later rainy weather.

In 1957 there was a mild wet early spring, followed by a particularly sunny June, when ergot germination may have taken place, and a long wet cool period from July to September. The period of inflorescence of the grasses was considerably prolonged by this weather pattern and may have led to heavy ergot infection as a result of the glumes remaining open much longer. The prolonged wet season in 1958 might also have favoured conditions for a widespread infection.

Jenkinson (1958) found that in the south-west of England in September, 1957, the percentage of infected rye grass reached 88 per cent. of inflorescences in some cases and that during the 2nd and 3rd week of October, a random sample of inflorescences was found to be 100 per cent. infected. Jenkinson points out that the greatest danger exists on pastures which have been grazed during the summer, and where by September most of the herbage consists of mature inflorescences previously neglected by grazing animals. Certain commercial strains of rye grass which flower abundantly are more liable to be heavily infected.

Although it was not possible to make a definite diagnosis in this outbreak of disease, it is thought that the clinical signs bear a close resemblance to those described as occurring in convulsive ergotism in other countries. Ergot had definitely been present in the field during the 1st year, perhaps extensively, as was shown by the demonstration of a sclerotium as late as the following January, and a heavy infection was found during the 2nd year. The demonstration of the solitary ergot may have indicated a heavy infection of the field during the 1st autumn and this contention is supported by the widespread infection in the following year.

Since one of the earliest effects of a hypovitaminosis A in animals is an immediate increase in the pressure of the cerebro-spinal fluid, it is thought that any future work on the pathology of ergotism should consider whether this may a factor in the development of the convulsive form.

Acknowledgments.—I wish to acknowledge my thanks to Dr. S. Wilkinson of the Chemical Research Laboratory of the Wellcome Research Laboratories for carrying out the estimations of ergot alkaloids, to Mr. J. T. R. Evans for arranging for this to be done, and to Mr. E. J. Hughes of Louth for bringing this case to my attention.

I wish to thank Dr. J. C. Buxton for his encouragement and advice.

References

ANON (1945). *J. Amer. vet. med. Ass.* **117.** 78.
BARGER, G. (1931). "Ergot and Ergotism." Gurney and Jackson, London, 1931.
———. (1938). *Handbuch der Exper. Pharma.* **6.** 84-226
CARLEVARO, G. (1956). *Zooprofilassi.* **11.** 587-95.
DILLON, B. E. (1955). *J. Amer. vet. med. Ass.* **126.** 136.
EDWARDS, C. M. (1953). *Vet. Rec.* **65.** 126.
FRAZAO, L. (1956). *Bol. pecuar.* **24.** 63-5.
GABBAI, LISBONNE & POURQUIER. (1951). *Brit. med. J.* Sept. 15th. 650-1.
GUILHON, J. (1955). *Rev. Path. gén. comp.* **55.** 1,467-8.
HUTYRA, F., MAREK, J., & MANNINGER, R. "Special Pathology and Therapeutics of the Disease of Domestic Animals." 4th Edn. Vol. III, p. 371. Baillière, Tindall & Cox, London.
JENKINSON, J. G. (1958). *Plant Pathology.* **7.** 81-5.
KAUNITZ, J. (1931). *Arch. intern. Med.* **47.** 548-64.
LATOUR, H. (1955). *Rev. Path. gén. comp.* **55.** 1,444-66.
MELLANBY, E. (1930). *Brit. med. Jour.* **1.** 67.
———. (1931a). Leading article, *Lancet.* **ii.** 918.
———. (1931b). *Brain.* **54.** 254-90.
NICOLAU, S., & GALLOWAY, I. A. (1928). "Borna disease and Enzootic Encephalomyelitis of sheep and cattle." H.M.S.O., London.
ROJDESTVENSKY, N. A. (1928). "Materials for Mycol. and Phytopath," Leningrad, 1927. **6.** 123-65. (From a translation in the library of the Imperial Bureau of Mycology, Kew.)
SIMPSON, C. F., & WEST, E. (1952). *Circ. Fla. Agric. Exp. Sta.* No. S-43, p. 6.

THE REGISTER OF VETERINARY SURGEONS

Under the provisions of Section 25 (3) of the Veterinary Surgeons Act, 1948, and Statutory Instrument No. 1729 of 1957, the undermentioned names were removed from the Register of Veterinary Surgeons on November 9th, 1959:—

JONES, William, Llwyn Hudol, Bryneglwys, Welshpool, Mont.; LEAVER, Eric Alfred, Woodborough, High Street, Banstead, Surrey; MACLEOD, David George, Easingwold, Nr. York; PINCHING, Robert Haugh, 6, North Street, Horsham, Sussex.

Papular Stomatitis of Cattle. II.—Reproduction of the Disease with Culture-passaged Virus

BY

W. PLOWRIGHT and R. D. FERRIS
East African Veterinary Research Organisation,
Muguga, Kenya

SUMMARY.—1. *All of 4 culture isolates derived from cases of bovine papular stomatitis produced typical primary and secondary lesions in the mouth and on the muzzle of experimentally-infected calves. The incubation period was 2 to 4 days, the lesions healing, without scar-formation, in a period of about 4 to 6 weeks p.i.*

2. *Virus could be readily recovered in culture from lesion material collected at the 13th and 16th days p.i. The new isolates were identified by their cytopathogenicity.*

3. *No systemic signs were seen in any inoculated calf but two had small, crusted lesions of the skin of the face.*

4. *Calves recovered from infection with one strain showed no reaction on reinoculation with any of the other 3 isolates and it is probable that all were antigenically the same or very closely related. It was not possible to demonstrate virus-neutralising antibody in the sera of the great majority of recovered calves.*

5. *These experimental results are briefly compared with those of German workers who investigated a clinically identical disease.*

IN a previous communication (Plowright & Ferris, 1959) we described the isolation in calf testis cultures of 4 strains of a virus associated with the mouth and muzzle lesions of spontaneous cases of an erosive stomatitis of cattle in Kenya. All of these isolates caused a similar cytopathogenic effect in cultured cells, including the production of intracytoplasmic inclusions comparable to those described by Schaaf *et al.* (1940) in the lesions of the natural disease. Preliminary attempts to prove an aetiological relationship between the cultured agents and the clinical syndrome observed were not satisfactory, but conclusive evidence has since been obtained by the inoculation of very young calves. This paper records details of the experiments concerned.

Materials and Methods

Virus Inocula

All 4 isolates previously mentioned (Plowright & Ferris, 1959) were used as homogenised, whole-culture material prepared as follows: Infected calf testis monolayers were frozen at −25° C., thawed at room temperature, shaken vigorously to remove all cells from the glass and the resulting suspensions treated for 5 minutes in Ten Broeck grinders. After centrifugation for 5 to 10 minutes at 2,000 r.p.m. the supernatants were stored until required at −25° C. Such preparations usually had a titre of 10^5 to 10^6 T.C.D. 50 per 0.2 ml. and contained residual penicillin, streptomycin and nystatin derived from the maintenance medium.

At the time of its use for animal inoculations each isolate had been through 3 to 7 passages in calf testis monolayers (see Table I).

Experimental Animals

Successful experiments were carried out with 11 calves, which were suckling their dams and were 1 to 24 days old at the time of inoculation. Their breeding was deduced from their appearance; 2 were high-grade Herefords, 2 low-grades and the remainder of shorthorn-zebu type. There was no apparent difference between the susceptibilities of grade and zebu animals.

The calves were carefully examined prior to, and virtually every day during, the observation period; their dams were only inspected at infrequent intervals. All calves and the majority of the cows were kept on daily morning temperature record, each pair being housed in separate loose-boxes.

Inoculations

Intradermal inoculations on the side of the neck caused no characteristic reaction and application of the virus by swab after scarification of the mucosa of the tongue, lower lip and gum similarly failed to produce any recognisable effect. It was then found that lesions similar to those of the natural disease could be initiated by submucosal inoculation in the mouth of undiluted virus in doses of 0.25 ml. One injection was usually made on each side of the mid-line where the mucosa of the lower lip was reflected on to the incisor gum. One or more inoculations were also made with a fine needle into the hard superficial tissues in the mid-line of the *planum nasale*.

Several calves received 0.25 ml. of undiluted virus in the conjunctival sac but no reactions followed.

Virus-neutralising Antibody Tests

Sera were obtained from a number of calves before and after the inoculation disease and also from others involved in a natural outbreak (see Table II). All were stored frozen at −25° C. until required. In some cases they were used unheated but the majority were heated at 56° C. for 30 minutes immediately prior to use.

Previous experience with sheep-pox (Plowright & Ferris, 1958) and contagious pustular dermatitis (Plowright *et al.*, 1959) did not lead us to expect any measurable neutralising effect against a fixed amount of virus if convalescent serum were diluted. All tests with papular stomatitis were therefore carried

out in the form of titrations of a virus sample in the presence of an equal quantity of undiluted serum. Pre-inoculation or acute-phase serum and the corresponding convalescent sample from each animal were tested simultaneously. The serum-virus mixtures were left overnight at 4° C. and inoculated in 0.2 ml. dosage into 4 tubes each of sheep kidney cells. The virus preparations (strains 2 or 3) which had previously undergone 1 or 2 passages in sheep kidney cells were treated in the same way as the virus-serum mixtures and inoculated at the same time.

Cytopathogenic end-points (50%) were calculated by the method of Thompson (1947), final observations being made on the 8th or 9th days following inoculation of the tubes.

Results

The Experimental Disease

An outline of the results of calf inoculations is given in Table I. All 4 isolates tested caused the production of characteristic lesions which were first detected 2 to 4 days after inoculation, beginning at the site of needle puncture; occasional animals showed minute hyperaemic foci at 24 hours p.i. Sometimes only one lip site showed a reaction whilst in calf No. 4890 no distinct primary lesion was observed at either side. One animal (No. 4785) inoculated by scarification of the *planum nasale* showed no effect but all other calves, with the exception of No. 4960, were injected superficially at this site and developed reactions which will be described later.

Primary lesions at the sites of lip inoculation were at first small erythematous foci, the centres of which became greyish and slightly raised after 24 to 48 hours, their diameter at this time being about 2 to 3 mm. By the 4th to 6th days following their appearance the lesions often reached 1 cm. in diameter, the central part being obviously necrotic, roughened and eroded, whilst the outer zone was still smooth, brightly erythematous and extending peripherally. Between the necrotic and erythematous zones there was frequently a distinct, greyish ring, comparable to those described by von Ostertag and Bugge (1906). Primary foci usually reached a maximum size of 1.5 to 2.0 cm. between the 7th to 10th days, their centres at this time often showing a caseous deposit. In 2 calves inoculated with strain No. 2 (Nos. 4785 and 4890) lesions were no longer detectable at either lip site after the 4th and 5th days respectively; both of these animals, however, later showed typical secondary lesions of the gums which persisted for much longer periods.

Healing of fully developed primary lesions commenced on the 8th to 12th days p.i. with a clearing of the necrotic debris and epithelial regeneration beginning centrally. A congested outer rim with incomplete healing often persisted until the end of the third week or even later but, when peripheral extension had ceased, epithelial regrowth also took place from the edge of the lesions. Although there was no scar-formation the areas involved in both primary and secondary lesions could sometimes be detected for a considerable time after regeneration by an unusual pallor or hyperaemia. The times shown in Table I for completion of healing do not take into account these extended periods. In heavily pigmented mouths it was naturally difficult to see hyperaemia, even in acute-phase lesions, but there was a definite discoloration and roughening often with the formation of distinct, greyish rings, the latter persisting for prolonged periods after epithelial regeneration.

Secondary lesions were detected on the mucosa of the lower lip and gum, the edge of the upper lip and on the dental pad from the 4th to the 8th days p.i. with a maximum frequency of appearance on the 5th and 6th days. They continued to increase in numbers until about the 14th day, being also found on the cheek papillae, on the edge or under-surface of the free part of the tongue and in the floor of the mouth behind the incisor teeth and around the carunculae. Other affected sites were the hard and soft palates. It is probable that lesions of the latter were overlooked early in the investigation but well-defined, rounded erosions, which reached a diameter of about 15 mm. were easily seen in a good light on withdrawal of the tongue of at least 2 later calves.

Secondary lesions showed a development identical to that of the primary ones already described, except

TABLE I
CALF INFECTIONS WITH TISSUE CULTURE STRAINS OF PAPULAR STOMATITIS VIRUS

Calf number	Strain and passage number	Incubation period*	Time to healing*	Time to challenge*	Challenge strain	Reaction to challenge	Remarks
4887	No. 1/BT5	2	28	30	No. 3	Nil	
5015	No. 1/BT4	4	22	—	—	—	Not challenged
4785	No. 2/BT7	3	22	—	—	—	" "
4888	No. 2/BT6	2	32	39	No. 4	Nil	
4890	No. 2/BT6	4	33	36	No. 1	Nil	Primary reaction only on muzzle and around incisors
4849	No. 3/BT3	3	24	24	"	Nil	
4897	No. 3/BT6	4	42†	27	"	Nil	
4960	? No. 3	<15	?	<15	"	+	Contact infection from 4897
4791	No. 3/BT3	2	22	27	No. 2	Nil	Congenital cleft palate
4883	No. 4/BT5	3	32	32	"	Nil	
4955	No. 4/BT3	3	23	24	No. 1	Nil	

* In days post-inoculation. † Scars at site of lesions visible to day 52.

that around the alveoli of the incisor teeth their appearance closely resembled that already noted in natural outbreaks of the disease in calves in Kenya (Plowright & Ferris, 1959). A raised, purplish granulation tissue was produced, on the surface of which yellowish flecks of necrotic material could be seen. Sometimes the change remained focal, at other times it extended to completely surround the incisor teeth. Its presence could easily have been regarded as due to non-specific bacterial infections, but the lesions appeared, regressed and healed at the same time as the other mucosal lesions. In our opinion they were undoubtedly due to papular stomatitis virus and represented a predilection site for its activity. The alveoli at the time of eruption of the teeth would appear to offer a favourable site for the ingress of the infection under natural circumstances.

Inoculation lesions on the *planum nasale* were observed at about the same time as those of the lower lip. Small foci of congestion appeared on the 2nd to 4th days p.i. and reached 5 to 10 mm. diameter by the end of the first week. They extended peripherally and showed the same tendency to the formation of an outer ring-zone. Centrally, however, muzzle lesions became slightly raised, rough and brownish. There was some superficial flaking but no easily detachable scabs formed and, in fact, the lesions appeared rather to be due to an irregular hyperplasia of the epithelium; they were very tough to cut with a scalpel. Clearing of the raised, roughened material began centrally, whilst the edge continued to expand, sometimes over areas of up to 3 to 4 cm. diameter. In a proportion of calves secondary lesions developed on the *planum nasale* and around the external nares. One animal (No. 4791), in which the turbinates were exposed to the mouth cavity by a large congenital cleft in the hard palate, also showed characteristic lesions of papular stomatitis within the nasal cavities. The extensive nature of the lesions which developed in this calf lent support to the hypothesis that this virus is one which ordinarily requires some accessory host factor for the full expression of its pathogenicity.

Calves Nos. 4791 and 4849, inoculated with virus of strain No. 3, were observed to have small, circular scabs on the skin of the face and lower lip, which attained a diameter of about 7 to 8 mm. by the end of the second week p.i. On detachment these showed a concave under-surface, and left a wet patch of skin denuded of hair. Superficially these lesions closely resembled those of cutaneous streptothricosis but no bacteriological examination was carried out. It is perhaps significant that this virus isolate was derived from mouth lesions of an ox which had been infected with a mild strain of rinderpest and had shown extensive skin lesions of a type sometimes attributed to that virus. We had been unable to demonstrate any significant bacterial flora in the skin lesions of this animal.

No systemic reaction attributable with certainty to papular stomatitis virus was noted in any inoculated calf. Two animals (Nos. 4791 and 4849) showed mild, transitory pyrexia on the 4th and 8th days p.i., the maximum temperatures recorded being 104.8° and 104.0° F., respectively. No blood protozoa were present at these times. Other animals developed pyrexia but were found to be infected with *B. bigemina* and treated accordingly. Slightly excessive salivation was noted in several animals at the time of maximum development of the mouth lesions but no diarrhoea or inappetence was ever recorded.

No lesions were observed on the teats or udders of the cows which suckled infected calves.

Recovery of the Virus from Experimental Calves

Three successful attempts were made to recover virus from the primary or secondary lesions in experimental calves. Calf testis monolayers were employed for this purpose. In one instance (calf No. 4888: strain No. 2) lesion scrapings were collected on the 16th day p.i. and the virus exhibited its typical full cytopathogenicity during the first culture generation. In the other 2 cases (Nos. 4849 and 4791: strain No. 3) material was harvested on the 13th day p.i.; it produced definite and specific changes but full cytopathogenicity was not recovered after 3 and 2 culture passages, respectively. The identity of the virus isolated was proved in all cases by the demonstration of numerous intracytoplasmic inclusions in fixed and stained coverslip preparations (Ferris & Plowright, 1948).

Further attempts to recover virus from experimental lesions were not made, in view of the consistency of the results reported above and the time-consuming nature of the procedures found to be necessary. An attempt to isolate virus from the buffy coat of about 60 ml. of heparinised blood, taken from calf No. 4791 at the peak of its temperature rise, was not successful.

Resistance to Challenge following the Experimental Disease

The immunity of 8 out of 10 experimentally-infected calves was challenged at 24 to 39 days p.i. by a repetition of the original inoculations at the lip and muzzle sites, but utilising a heterologous strain. The infectivity of the challenge materials was tested by simultaneous inoculation into susceptible calves. Whilst all possible reciprocal relationships between isolates were not tested it is apparent that calves recovered from infection with one stain were solidly immune to challenge with any of the others; *i.e.* there was no evidence of immunological diversity.

Calf No. 4960 was brought out daily for temperature recording into a crush which was also used for infected calf No. 4897. During the first 15 days of life it was left uninoculated. At the end of this period it had lesions of papular stomatitis which were probably at least 4 to 5 days old and acquired by contact. It was challenged with strain No. 1 and although typical lesions developed at both lip sites these had healed completely by the 10th day following, *i.e.* considerably faster than would be expected in a fully susceptible animal.

Attempts to Demonstrate Neutralising Antibody in the Sera of Calves

The effect of undiluted sera on the titre of virus

TABLE II
ATTEMPTS TO DEMONSTRATE NEUTRALISING ANTIBODY FOR PAPULAR STOMATITIS VIRUS IN CALVES

Calf number	Type of infection	Date	Stage of disease	Effect of heated serum on virus titre	Effect of unheated serum on virus titre	Remarks
4324	Natural	16.7.58	Acute	−0·8	ND	—
		31.7.58	Recovering	−0·5	ND	—
		11.8.58	Healed	−0·8	ND	—
4360	Natural	16.7.58	Acute	−0·4	+0·6	—
		11.8.58	Healed	−0·8	Nil	—
4361	Natural	16.7.58	Acute	ND	−0·3	—
		31.7.58	Regressing	ND	Nil	—
4369	Natural	24.7.58	Early acute	−0·5	ND	—
		7.8.58	Regressing	−1·2	ND	—
4372	Natural	24.7.58	Early acute	−0·2	ND	—
		7.8.58	Healed	−0·2	ND	—
4785	Experimental	15.12.58	Day of inoculation	−0·3	−0·3	—
		6.1.59	22 d.p.i.	−0·3	−0·6	Completely healed
4791	Experimental	6.1.59	Day of inoculation	−0·8	−1·8	—
		20.1.59	14 d.p.i.	−0·3	−0·6	Lesions still active
4849	Experimental	30.1.59	21 d.p.i.	−0·4	ND	Completely healed
4883	Experimental	22.1.59	Day of inoculation	−0·6	ND	—
		4.2.59	13 d.p.i.	−0·4	ND	Lesions regressing
		13.2.59	22 d.p.i.	−0·6	ND	,, ,,
4887	Experimental	3.2.59	1 d.p.i.	−0·8	ND	—
		2.3.59	27 d.p.i.	−0·8	ND	Completely healed
4888	Experimental	3.2.59	1 d.p.i.	−0·4	ND	—
		2.3.59	27 d.p.i.	−0·6	ND	Nearly healed
Tübingen	Experimental	?	13 d.p.i.	+0·3	ND	Received from Dr. A. Mayr

ND = Not done

preparations is shown in Table II. If the figures for heated sera are examined it is evident that only in one natural case (No. 4369) was there any evidence for the development of a significant level of neutralising activity. All inactivated sera from 9 susceptible Kenya calves did cause a varying though slight depression of titre, but no increased activity was found in 8 of the 9 corresponding convalescent samples. Only 1 of 5 unheated sera caused an appreciable depression of titre and this was from a 9-day-old calf (No. 4791) prior to infection.

A single convalescent serum from a calf inoculated with the Göttingen strain of virus was received from Germany by courtesy of Dr. A. Mayr. This also showed no neutralising effect.

Discussion

Evidence has been produced that all of 4 strains of a virus isolated in calf testis cultures, from the lesion scrapings of cattle with an erosive stomatitis, were capable of producing lesions in experimental calves comparable to those observed in naturally-occurring cases of the disease. The method of inoculation which we employed was quite different from that of von Ostertag and Bugge (1906) or Schaaf *et al.* (1940). Both of these groups of authors used only lesion material for transmission, the former initially by implantation in mucosal pockets on the under-surface of the tongue, the latter by scarification. As previously noted we failed to produce any characteristic reaction by scarification of mouth or muzzle mucosa and had recourse to submucosal inoculation of the lip or the equivalent of intradermal inoculation in the muzzle.

Von Ostertag and Bugge recorded local swelling and reddening after 2 to 4 days with a recession after 6 to 7 days; this they apparently regarded as a non-specific reaction but typical, generalised lesions of papular stomatitis were detected elsewhere in the mouth cavity from the 13th to 14th days. Schaaf *et al.* noted early foci of hyperaemia along the lines of scarification after 24 to 48 hours, with subsequent development of papules; our observations are essentially in agreement with this, especially if it is remembered that our inocula were bacteriologically sterile. It is quite possible that the primary reactions observed by von Ostertag were also, at least partially, specific and, if this is true, all these data on the incubation period of the inoculation disease are essentially similar.

Schaaf *et al.* noted that the lesions produced by glycerinated preparations were less severe and of shorter duration than those caused by untreated tissue suspensions. The number of papules which formed along scarification lines was not, however, reduced to any marked degree by glycerine treatment

and they suggested that some glycerine-sensitive bacterium might account for the greater severity of the lesions caused by untreated virus. Our experience indicated that large doses of culture virus (10^5 to 10^6 T.C.D. 50) when deposited in or under a susceptible mucous membrane were often only just sufficient to produce a small local lesion, from which a greater number of more pathogenic particles were released to extend the parent focus and to establish others elsewhere in the mucosae. It is impossible at present to obtain figures for the comparative infectivity of virus preparations in cultures and in cattle, but the indications were that high-titre culture virus contained few particles which were pathogenic for cattle and that fresh lesion material often contained relatively few particles of high cytopathogenicity for calf testis cells.

So far as other manifestations of the experimental disease are concerened we agree with the German workers quoted above that no systemic signs are observed. The small lesions of the skin of the face, which we recorded in 2 calves, may have been comparable to the scab-formations reported by von Ostertag and Bugge. Schaaf *et al.* noted the complete absence of such lesions in cases which they had observed and therefore used it as a point of minor differentiation between the two clinical entities. It may not be accidental that the majority of cases of advanced cutaneous streptothricosis in Nigeria (Plowright & Ferris, 1959) also had a proliferative stomatitis, in the lesions of which it was easily possible to detect intracytoplasmic inclusions identical to these described by Schaaf *et al.* Is it possible that the virus may have some part to play in the pathogenesis of the skin disease, reproduction of which with pure bacterial cultures is notoriously difficult?

Thienpont *et al.* (1958) described cases of an extensive dermatitis and stomatitis of cattle in Ruanda Urundi which they were able to transmit with lesion material. It was recently reported (Huygelen *et al.*, 1959) that the causal agent produced necrotic lesions on the C.A.M. of developing hens' eggs and on the scarified skin of rabbits. Elementary bodies similar to those of vaccinia were seen in stained smears of the pock-like lesions in eggs and the virus was neutralised by hyperimmune vaccinia sera, prepared in guinea-pigs. We have failed to observe any reproducible effect when papular stomatitis virus was inoculated into eggs and saw only mild, transitory lesions following intradermal inoculation of rabbits. The viruses associated with these two clinical conditions in Africa would therefore appear to be dissimilar.

Our failure to detect significant levels of neutralising antibody in the sera of the great majority of recovered calves was surprising, especially in view of their complete resistance to challenge inoculation. It must, however, be borne in mind that von Ostertag *et al.* reported recrudescence of the disease over periods of several months in individual animals and this suggests a very poor immunity. We also have observed relapse to papular stomatitis in cattle which had been infected with a mild strain of rinderpest (Plowright & Ferris, 1959).

The absence of an effective neutralising antiserum has precluded any investigation of the possible antigenic relationship of papular stomatitis to other pox-group viruses. We have failed to show neutralisation with the sera of sheep recovered from contagious pustular dermatitis, a virus which produces *in vivo* and *in vitro* pathogenic effects closely comparable to those of bovine papular stomatitis (Plowright & Ferris—unpublished observations). These sera had a definite neutralising effect on the homologous virus.

Acknowledgments.—We are grateful to Dr. A. Mayr of the Bundesforschungsanstalt fur Viruskrankheiten der Tiere, Tübingen, Germany who supplied us with convalescent serum from a calf inoculated with Göttingen strain of virus. Thanks are due to Mr. H. R. Binns, Director of E.A.V.R.O. for permission to publish these results.

References

FERRIS, R. D., & PLOWRIGHT, W. (1958). *J. path. Bact.* **75.** 313.
HUYGELEN, C., VAN TONGEREN, H. A. E., & MORTELMANS, J. (1959). *Zentbl. vet. Med.* **6.** 154.
PLOWRIGHT, W., & FERRIS, R. D. (1958). *Brit. J. exp. Path.* **39.** 424.
———, & ———. (1959). *Vet. Rec.* (in press).
———, WITCOMB, M. A., & FERRIS, R. D. (1959). *Arch. exp. Virusforschung* (in press).
SCHAAF, J., TRAUB, E., & BELLER, K. (1940). *Zeitschr. infekt. Krkh. Haust.* **56.** 85.
THIENPONT, D. H. C., MORTELMANS, J., BICHE, Y., & PINCKERS, F. (1958). *Bull. epiz. Dis. Afr.* **6.** 295.
THOMPSON, W. R. (1947). *Bact. Revs.* **11.** 115.
VON OSTERTAG, R., & BUGGE. (1906). *Zeitschr. infekt. Krkh. Haust.* **1.** 3.

SPECIAL UNIVERSITY LECTURES

A course of two special university lectures in veterinary science by Dr. J. R. M. Innes, of the Brookhaven National Laboratory, Long Island, U.S.A., will be given at the Royal Veterinary College, Royal College Street, N.W.1, at 4 p.m. on December 4th and 7th, 1959. Lecture I: The Spinal Cord; Lecture II: Diseases of Laboratory Animals. At the first lecture the chair will be taken by Dr. R. E. Glover, Principal of the Royal Veterinary College. The lectures are addressed to students of the university and to others interested in the subject, and admission is free, without ticket.

Correction

We are asked to say that in the paper *Surgical Correction of a Displaced Bovine Abomasum* by Tutt, Richards and Yarrow (*Vet. Rec.* **71.** 620) the third author was T. G. Yarrow and not T. B. Yarrow as stated.

News and Comment

A FORENSIC SCIENCE SOCIETY

A decision to form a Forensic Science Society was taken at a well-attended meeting held at Nottingham University on October 31st. The object of the society is to advance the study and application of forensic science in all its branches. With this aim in view, a series of symposia, to be held alternately in London and in the provinces, is being arranged. Among the subjects suggested for discussion are Blood, Hypoglycaemia, Street Accidents, and Instrumentation.

All persons professionally interested in forensic science are eligible for membership. The president of the Society is Dr. J. B. Firth, and the secretary, Dr. E. G. C. Clarke of the Royal Veterinary College, London, N.W.1, from whom further information may be obtained.

THE EQUINE RESEARCH STATION OF THE ANIMAL HEALTH TRUST

Last week, in reporting the bestowal of the Queen's patronage on the Animal Health Trust, we referred to some notes it was hoped to publish about the work of the Trust's Equine Station. These notes were handed to the Press at the time the announcement was made, and the substance of them is as follows:—

The Station has helped many famous owners and treated many celebrated horses. For example, it has not been published widely hitherto that before the record price of £250,000 was paid for *Tulyar*, a heart examination by veterinary surgeons at the Station was insisted upon as a condition of purchase. *Happy Laughter* was treated there for sinus trouble, without which, it has been said, this horse might never have gone on to win the One Thousand Guineas. *Lightning*, the dam of *Parthia*, the Derby winner, was another patient, and the Trust has been asked to advise from time to time on the condition both of *Parthia* and *Alcide* during their training at Captain Boyd Rochfort's nearby stables.

To celebrate the honour conferred by the Queen it has been decided to build a new surgical unit at the Equine Station. Members of the profession there have pioneered a number of operations on the horse. Among them have been the exchange blood transfusion technique previously described in these pages, the removal of damaged splint bones, and the successful creation of a new tear duct, the original duct being blocked.

The new surgical unit is expected to cost about £30,000.

MR. JAMES ROBERTSON

Mr. William Harley writes:—

James Robertson died on October 31st at Weston-super-Mare. A native of Glasgow, he was a successful practitioner during the horse era and practised chiefly in Norfolk, Stourbridge, and Wolverhampton. The kindliest of men, he was generous beyond belief, a quality which he maintained he inherited from his father.

He was fond of company, and was prominent in Masonic circles in Birmingham. The death of his son Ambrose some years ago, who practised at Kidderminster, was a sore blow to Mrs. Robertson and him, and our sympathy goes out to Mrs. Robertson, and to her married daughter, Mrs. Hastie, of Birmingham.

R.C.V.S. OBITUARY

We record with regret the deaths of the following members of the profession:—

FORBES, James Thomson, Straits Racing Association, P.O. Box 3011, Singapore. Graduated December 18th, 1924, at the Royal (Dick) Veterinary College, Edinburgh. Died in London on November 2nd, 1959.

KIDD, Alexander Adam, T.D., of the Olde Plough, Priest End, Thame, Oxon. Graduated December 19th, 1929. Died November 8th, 1959, aged 51 years. *Supplementary Veterinary Register.*

BARTLETT, Corbett John Manfield, Westbury, Derby Road, Wirksworth, Derby. Died November 3rd, 1959, aged 87 years.

UNIVERSITY NEWS

Liverpool

Degree of B.V.Sc., Second Examination Part III (Animal Management)

Gardner, W. B.; Harper, F. D. W.; and Waud, R.

PERSONAL

Mr. D. M. Forde, Veterinary Officer, who was stationed at Truro, has resigned.

Marriage

NEWMAN—HILLIAR.—On November 7th, 1959, Michael A. H. Newman, B.V.SC., M.R.C.V.S., of Buxton, Derbyshire, to Ruth Anna Hilliar of Rolleston, Leicestershire.

Births

ASHWORTH.—On October 30th, 1959, to Barbara, wife of Keith T. Ashworth, B.V.SC., M.R.C.V.S., of "Short Hill," Livesey Road, Ludlow, a daughter, Janet Elizabeth.

BARR.—On October 28th, 1959, to Mr. and Mrs. W. M. Barr, Duisdale, Lochgilphead, a son.

BARR.—On September 20th, to Margaret, wife of Andrew Gordon, B.V.M.S., M.R.C.V.S., of St. Annes, Lancs., a son, David James, brother for Gordon Andrew.

RUTHERFORD.—On October 31st, 1959, at the Old Villa, Sandbach Road, Alsager, Stoke-on-Trent, to Theresa, wife of Leonard H. Rutherford, M.R.C.V.S., a son, Kevin, brother for Fiona.

COMING EVENTS

November

18th (Wed.). Meeting of the Scottish Metropolitan Division in the Royal (Dick) School of Veterinary Studies, Edinburgh, 2.30 p.m.

Dinner-Dance of the Western Counties Veterinary Association at the Imperial Hotel, Exeter, 7 p.m.

19th (Thurs.). Annual Dinner-Dance of the V.V.B.F. Northern Region in the Northern Hotel, Aberdeen, 7.30 p.m.

Meeting of the Society of Practising Veterinary Surgeons at the Royal Station Hotel, York, 7.30 p.m.

Annual Dance of the V.V.B.F. County of Ayr Ladies' Guild in Western House, Ayr.

Reception and Dance of the Shropshire Veterinary Club at the Grapes, Bicton Heath, Shrewsbury, 9 p.m.

Dinner-Dance of the Lakeland Veterinary Association at the Hydro Hotel, Windermere, 7.30 p.m.

20th (Fri.). Dinner-Dance of the V.V.B.F. Ladies' Guild, Dumfries and Galloway Division, in Lockerbie House Hotel.

25th (Wed.). Annual Supper Dance of the Scottish Metropolitan Division at the Calton Hotel, North Bridge, Edinburgh, 8 p.m.

26th (Thurs.). Meeting of the B.V.A. Overseas Committee at 7, Mansfield Street, London, W.1, 11 a.m.

Meeting of the Supplementary Veterinary Register Association at 7 Mansfield Street, Portland Place, London, W.1., 2 p.m.

27th (Fri.). Annual Dance of the Northern Ireland Veterinary Association in Thompson's Restaurant, Callender Street, Belfast, 11.30 p.m.

28th (Sat.). Meeting of the Metropolitan Region of the B.S.A.V.A. at 1, Wimpole Street, London, W.1; dinner 7 p.m. for 7.30 p.m.; paper 9 p.m.

December

6th (Sun.). Meeting of the Kenya Veterinary Association at Uplands Bacon Factory and Sports Club, 11 a.m.

9th (Wed.). Meeting of the Southern Counties Veterinary Society at the Conference Room, Civic Centre, Southampton.

ADDRESSES OF DISEASE INFECTED PREMISES

The list given below indicates, first the county in which are situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak.

Anthrax

Banffshire. 16, Main Street, New Mill, Keth (Nov. 5).

Gloucs. Heath End Farm, Cromhall, Wootton-under-Edge, (Nov. 4).

Lanarks. Stewartfield Farm, High Blantyre, Glasgow (Nov. 4).

Fowl Pest

Bucks. Manor Farm, Aylesbury Road, Wendover, Aylesbury (Nov. 4).

Cambs. 31, The Avenue, March (Nov. 3); Woodcroft, The Avenue, March (Nov. 4); 20, Oak Tree Road, Fen Drayton (Nov. 5).

Derbys. 219, Handley Road, New Whittington, Chesterfield (Nov. 4).

Essex. The Ark, Broadway, Dunmow (Nov. 3).

Gloucs. 4, Church Cottages, Church Street, Bredon, Tewkesbury (Nov. 4); Manor Farm, Weston-sub-Edge, Chipping Campden; Jones Slad Farm, Bisley, Stroud (Nov. 5).

Hunts. Mill Lane, Hemingford Grey, and Barley Hill, Somersham Road, St. Ives (Nov. 3); 32, West Street, St. Ives; Mayfield Church Street, Hemingford Grey, Huntingdon (Nov. 4); 28, West Street, St. Ives (Nov. 5).

Kent. 3, Yew Tree Cottages, Broadwater Forest, Langton Green, Tunbridge Wells; Whitehall Farm, Capel le Ferne, Folkestone (Nov. 3); 1, Lusted Hall Lane, Tatsfield, Westerham (Nov. 4).

Lancs. 15, Farnworth House Estate, Duxbury, Chorley (Nov. 3).

Lincs. 35, Sleaford Road, Ruskington, Sleaford (Nov. 3); Bungalow Farm, Gautby, Wragby; Oldhall Gardens, Gautby, Wragby; 67, Boston Road, Heckington, Sleaford; North Ings Farm, Dorrington, Lincoln (Nov. 4); 55, Manor Street, Ruskington, Sleaford; 42, Boston Road, Heckington, Sleaford (Nov. 5).

Norfolk. Woodgate, Swanton Morley, Dereham (Nov. 3); 1, Council Houses, St. Faiths, Norwich (Nov. 4); Ash Tree Farm, Ingworth, Norwich (Nov. 5).

Northants. Southview, Welford Road, Kingsthorpe, Northampton (Nov. 3).

Suffolk. 4, Church Road, Felsham, Bury St. Edmunds; Poplar Farm, Felsham, Bury St. Edmunds (Nov. 3).

Surrey. Slythehurst, Ewhurst, Cranleigh (Nov. 3); Sayers Croft Farm, Ewhurst, Cranleigh (Nov. 4).

Sussex. Broomwood Farm, Cowheech, Hailsham (Nov. 3); Egypt Farm, Rushlake Green, Heathfield (Nov. 4).

Worcs. The Brickworks, High Street, Feckenham, Redditch; 18, Bevans Lane, Hinton-on-the-Green, Evesham (Nov. 3); The Ranch, Honeybourne, Evesham; 17, Bevens Lane, Hinton-on-the-Green, Evesham; Elms Farm, Pursall Green, Ruslock, Droitwich (Nov. 4); Warwick House, Stratford Road, Honeybourne, Evesham (Nov. 5).

Swine Fever

Devon. Brooklyn, Fordton, Crediton; Haywood Farm, Weaver, Plymtree, Cullompton (Nov. 4); Beare House, Crediton (Nov. 5).

Essex. Pamree, Lodge Lane, Collier Row, Romford (Nov. 4).

Glam. Pen-y-Bryn, Cross Common, Dinas Powis (Nov. 3).

Gloucs. Edge Farm, Edge, Stroud (Nov. 3).

Lancs. Clark's Farm, Prescot Road, Melling, Maghull, Liverpool; 20, Smallholding, Yew Tree Road, Fellowfield, Manchester (Nov. 3); Waddicar Farm, Chapel Lane, Melling, Liverpool; Stonehouse Farm, Lostock, Bolton; Openshaw Fold Farm, Radcliffe, Manchester (Nov. 4).

Leics. O/C Depot, Glen Parva Barracks, Wigston, Leicester (Nov. 5).

Norfolk. Whitehall Farm, Horningtoft, Fakenham; Meadow Farm, North Pickenham, Swaffham; Stockyard Farm, North Pickenham, Swaffham; Hope Villa, Station Road, Belton, Great Yarmouth (Nov. 4); The Hall, Thrigby, Great Yarmouth; Valley Farm, Corpusty, Norwich (Nov. 5).

Northants. Rectory Farm, Ecton, Northampton; Denton Wood Farm, Denton, Northampton (Nov. 4).

Somerset. Hinton Farm, Mudford, Yeovil (Nov. 4); Harmay, Edithmead, Highbridge (Nov. 5).

Suffolk. Comister House, Ixworth, Bury St. Edmunds (Nov. 4).

Sussex. Leason House, Rye Foreign, Rye (Nov. 5).

Warwicks. Fulwood Fields Farm, The Common, Earlswood, Solihull (Nov. 4).

ADVERTISER'S ANNOUNCEMENT

PHARMACEUTICAL SPECIALITIES (MAY & BAKER) LTD. announce the introduction of "Vallergan" brand trimeprazine tartrate in tablets of 10 mg. and 25 mg. and in 1 c.c. and 5 c.c. ampoules of 1 per cent. solution.

Letters to the Editor

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the B.V.A.

GENERAL

The Colonial Veterinary Service

Sir,—A brief comment on the letters by Messrs. Earnshaw and Cooke on the above subject (*Vet. Rec.* **71.** 706 and 775) appears to be indicated.

It is a fact that there has been a steady exodus of veterinary surgeons from overseas posts and also that recently it has been difficult to find replacements. There is no doubt that the most important single contributory factor leading to this state of affairs is the relatively low scales of salary offered. The difference between home and overseas emoluments has not just narrowed, it has disappeared completely. This, coupled with higher cost of living and taxation levels, makes employment abroad unattractive to-day. The attention of overseas governments has been drawn to the present high market value of veterinary surgeons, but most salary reviews in recent years have been ineffective in meeting fully the needs of a profession enjoying a fairly long phase of maximum employment. Private individuals and commercial firms can vary more readily than can governments the terms of employment which can be offered. In referring to the possibility of longer term contracts I had in mind, and had indeed recommended also, more generous contract salaries and higher gratuities. Adjustments here might be more easily achieved than in the permanent and pensionable scales. It is a fact that many officers with periods of service in excess of 10 years overseas have found employment at home, but I would agree that should the market become more competitive it might then be more difficult for some to make a fresh start.

Recently, many other important factors have had an unsettling effect on staff, and most of these can be overcome only by sympathetic and wise direction locally. In fairness to those concerned the rapidly changing political scene has created unusual difficulties, and advice given is not always accepted or acted upon. Most serving officers, however, have striven at all times to preserve and enhance the status of the profession they represent abroad.

Exception has been taken to my use of the expression over-fussy in relation to recent candidates for appointment. This was based on observations made at many interviews and discussions, and although this could not be regarded as a major deterrent, it exists. Those of us who can recall the early thirties might possibly agree that the employment situation then was slightly different from what it is to-day, and we were conditioned to that situation.

Colonial Office,
Sanctuary Buildings,
Great Smith Street,
London, S.W.1.
November 4th, 1959.

Yours faithfully,
R. S. MARSHALL,
Animal Health Adviser.

Hydramnios in the Ewe

Sir,—I was very interested in the article published by Messrs. Coles and Kirby in THE VETERINARY RECORD of October 31st, as in this practice we, too, were presented with a case of hydropsamnii in the ewe during last lambing season. In an attempt to maintain pregnancy and obtain live lambs, we limited our activities to draining some 4 gallons (measured) of fluid from the amnion *via* a small incision in the low left sub-lumbar fossa, under para-vertebral anaesthesia. The ewe was almost recumbent before the operation, but afterwards, relatively normal. The owner reported that she delivered 2 normal but premature lambs 4 days later; unfortunately she died during the delivery of a third lamb, the presence of which the owner had not suspected.

With reference to the similar condition in the cow, we have recently treated 2 cases by simply removing the cervical seal, thus initiating parturition. In contradiction to the authors referred to by Neal (1956), removal of this seal was very easy, and parturition followed normally in one case, and with a complication which could in no way be attributed to the technique in the other. Details are as follows:—

Case I. An aged Guernsey cow, approximately 8 months pregnant and on the edge of recumbency, due to abdominal distension. Treatment at this stage was limited to removal of the cervical seal, the pressure within the uterus immediately forcing a pocket of the allantois chorium into the anterior vagina. No further action was taken as it was hoped that the membranes would rupture and parturition follow.

This did, in fact, occur, the owner reporting that the cow had produced, without assistance, a dead anasarcous calf. Her lactation has been uneventful.

Case II. A Devon cow carrying her second calf again approximately 8 months pregnant and on the verge of recumbency. The owner reported that due to her inability to walk far, she had eaten almost nothing for a week and was rapidly losing flesh.

The cervical seal was again removed and again the membranes were forced into the anterior vagina. When seen 24 hours later, jets of fluid were passing from the vagina. When examined, the cervix was found to be two-thirds dilated and the calf in normal presentation at the pelvic brim. Even with this widely opened cervix, little or no fluid escaped between uterine contractions, though the latter was still abnormally distended.

As parturition seemed to be proceeding normally, the owner was asked to report if the calf had not been delivered within 24 hours. He did not contact us for 36 hours, and when the cow was examined it was found that torsion of the uterus had taken place. This proved to be irreducible and caesarean section was performed. Slight shock and some peritonitis followed but the animal was eating heartily within 3 days and normal recovery took place.

Two cases do not provide sufficient evidence for any real conclusions to be drawn, but the following points emerge: The method is extremely simple; shock is avoided owing to the "natural" rate at which the fluid is lost; the necessity for caesarean section will frequently be avoided, thus enhancing chances of further breeding and/or lactation. Even in those cases where it is still necessary due to failure of the cervix to dilate, or the presence of a normal

calf, the animal will be in a stronger condition to stand the operation.

It would seem probable that in cases in which the membranes do not pass through the cervix, it would be necessary to rupture them mechanically, though dilatation of the cervix would then be less likely to follow naturally.

No originality is claimed, the basis of the method having been applied in the human subject for years in cases where "surgical-induction" is necessary.

I wish to express my thanks to Messrs. Griffiths and James, MS.R.C.V.S., for allowing complete freedom of action.

Yours faithfully,

"Skrinkhills,"
Tiverton,
Devon.
J. C. HINDSON.

November 2nd, 1959.

Reference

NEAL, C. A. (1956). *Vet. Rec.* **68**. 89.

Orthopaedic Surgery in Exotic Mammals

Sir,—Miss Joshua will, I hope, forgive me if I question her estimate, contained in her letter of October 6th (Joshua, 1959), of the overdose of anaesthetic she administered to a Bush Baby before operating on it for the open reduction of a fractured femur.

Accepting Miss Joshua's own figures as the basis for calculation the overdose exceeded the correct dose by nearer 66⅔ per cent. than the 25 per cent. she has estimated. Thus:—

Correct dose at 1/5th gr. per lb. bodyweight for 3 oz. is $1/5 \times 3/16$ gr. $= 3/80$th gr.

Dose administered at 1/4 gr. per lb. bodyweight for 4 oz. was $1/4 \times 4/16$ gr. $= 1/16$th or 5/80th gr.

Clearly there was an overdose of about 2/80th of a gr. which is 66⅔ per cent. of the dose of 3/80th of a gr. which, according to Miss Joshua's own statements, would have been correct.

This being the case the outcome of the operation on the Bush Baby is, perhaps, less surprising than Miss Joshua's letter would suggest.

Yours faithfully,

M. C. G. LITTLEWORT.
Department of Veterinary Clinical Studies,
School of Veterinary Medicine,
Madingley Road,
Cambridge.

November 5th, 1959.

Reference

JOSHUA, J. O. (1959). *Vet. Rec.* **71**. 796.

Extra-uterine Pregnancy

Sir,—The article by Ashdown and Marrable (THE VETERINARY RECORD, November 7th, 1959) reminds me of a case I saw in 1952.

The subject was a Jersey cow due to calve her fourth calf in about a week. This cow had for some days been showing signs of abdominal pain. I made a tentative diagnosis of traumatic gastritis and decided to do a rumenotomy.

Entrance to the abdomen through the left flank brought about an escape of several pints of watery fluid containing a large number of fibrinous deposits. The visible peritoneum was rough and inflamed.

Manual exploration of the abdomen revealed the presence of a live calf lying ventrally and to the left of the uterus. The calf, which was completely free of any covering membrane, was lifted out through the abdominal incision. There was a 9-inch rent in the left uterine horn through which passed the umbilical cord and from which hung a small portion of placenta. The rent in the uterus gave the appearance of having healed around the portion of projecting placenta and umbilical cord.

No attempt was made at surgical closure of the uterine fistula, the placenta was trimmed off with scissors, and the abdominal incision closed in the usual manner.

The cow made an uneventful recovery. The placenta was passed about one week after the operation. The uterus involuted normally and a normal oestrous cycle ensued. All attempts to get the cow to conceive were unsuccessful; the only abnormality palpable *per rectum* was a small adhesion on the left uterine horn.

The calf, which appeared fairly normal at the time of the operation, died on the fourth day.

Yours faithfully,

R. M. WILSON.
105, Halsford Park Road,
East Grinstead,
Sussex.

November 12th, 1959.

The Use of Succinylcholine Chloride as a Casting Agent in the Horse Prior to the Induction of General Anaesthesia

Sir,—With reference to the article you recently published over our names on "The Use of Succinylcholine Chloride as a Casting Agent in the Horse Prior to the Induction of General Anaesthesia," issue of October 17th, pages 731 to 735, we notice that there is an important error on page 733. The heading of the Table states a dosage of 9 mg. per kg. bodyweight. This should read 9 mg. per 50 kg. bodyweight, as is made clear in the text on page 732.

Yours faithfully,

P. A. NEAL.
J. G. WRIGHT.
The University of Liverpool,
Field Station,
"Leahurst,"
Neston,
Wirral.

November 7th, 1959.

The Influence of Diet upon Exotic Birds

Sir,—The recent interesting and informative letter by Miss Joan Joshua on orthopaedic surgery in exotic animals, has stimulated me to report upon a case about which I was recently consulted.

One evening, I received a telephone call from an orthopaedic surgeon regarding the treatment of an African ostrich in the Tehran Zoo. It was dark on our arrival at the Zoo, which is some distance from Tehran, and by the light of a flaming torch we entered a large pen containing 12 fully grown African ostriches, which eyed us with interest, whilst a crowd of people pressed against the bars, full of curiosity. One bird was very lame. The condition had been diagnosed as joint dislocation. To remedy this the surgeon had suggested a pinning operation which he was anxious to perform.

The manager of the Zoo, an experienced hunter and trapper of wild animals, had one of the finest physiques of any man I had ever seen. He assisted me to stabilise the bird whilst I examined the affected joint. The limb whirled round at right angles to the vertical, and having been lifted off my feet by the powerful swinging of the bird's leg more than once, I was able finally to examine the joint. This confirmed the immediate diagnosis I had made when first entering the pen: from the bird's frustrated attempts at locomotion the joint was not dislocated; this was a case of perosis.

Enquiries showed that on arrival at the Zoo 3 months previously this bird had been the largest of the group, and a day or two afterwards had suddenly developed severe lameness and was unable to stand.

There is little doubt this was due to the fact that the diet was lacking in the essential minor elements necessary to provide for the rapid growth of the bird, producing the condition commonly referred to as "slipped tendon." At the time of the examination the condyles had been so altered that there was no possibility of the tendon remaining in its normal position and I recommended that the bird should be destroyed.

In the past I have seen spectacularly quick and complete recoveries from perosis in turkeys, caused by faulty feeding, by the addition to their diet of blood fibrogen, and special feeding bone meal. The condition is often seen when turkeys are penned on clover leys, and the development of the long bones, particularly the femoral condyles, are arrested over the epiphyses; the manganese and choline availability or deficiency being influenced by the high calcium salts taken in the form of clover leaf.

Yours faithfully,

K. D. DOWNHAM.

Well Cottage,
Spuley Lane,
Bollington,
Nr. Macclesfield,
Cheshire.

November 9th, 1959.

Transport of Wild Animals

Sir,—Recent comments on the "monkey business" from S.E. Asia might warrant some further remarks on this distressing trade partly centred on Singapore, which for decades has been an entrepôt base for supplying wild animals and birds to zoos and collections in the west and the Americas. It was only logical that the supply of monkeys for research purposes should be added onto an existing supply organisation, when the need arose.

The orthodox system of supplying zoological specimens entails the placing of forward orders for one or a few animals of a species, and, as neither the time factor nor the cost is usually of primary consideration, dealers took good care to ensure that animals or birds were held in collecting centres, often for many months, until they were fairly tame and accepted a different environment. Even so, certain species have always been difficult to transport, particularly primates.

The huge demands for Rhesus-type monkeys is a very different proposition, and traders in Asia were faced with the problem of supplying at the shortest possible notice consignments of hundreds and sometimes a thousand or more for research purposes. The landed cost moreover in most cases had to be within the usually restricted financial provisions of laboratories.

The ideal system would have been to follow the successful methods of wild-animal traders in retaining monkeys for some months after capture, partly to tame them and partly to separate the inevitable "bullies" from their victims, prior to shipment overseas, preferably by air.

In India, as a rule, monkeys are more familiar with human beings, and are far more easily tamed than those from the Malaysian rain forest regions, where the chance of contacts with man are more unlikely, but the Indian Government for humane reasons restricted the export of their monkeys, and the balance had to be found from the latter areas and exported mainly from Singapore.

The Malaysian monkeys are truly feral, and being unused to civilisation their capture leads to a state of abject terror. When captured in large numbers, heavy mortality from fighting amongst themselves is the rule even when separated into small batches.

It was for this reason that traders preferred to go to the opposite extreme, and reduce the time-lag between netting from the jungles to delivery at laboratory to as short a time as possible including air transport to minimise losses.

My colleagues in Singapore have insisted, where possible, on size and types of cages with adequate facilities for food and water, and the separation of consignments within respective cages to age and size conditions to minimise bullying. Most airways companies have co-operated fully, but it is quite impossible to overcome the stark fear from which these monkeys suffer. The noise and vibration of aircraft and ship; the variations in temperature, humidity, and pressure between flight and land even with the best equipped craft, are all factors which enhance fear and consequent mortality.

The alternative is to insist on several months' holding prior to shipment in small batches to tame these creatures, and thus postpone their demise to suit the laboratories' requirements. But with the many thousands of monkeys involved, it would require a quarantine organisation of no mean size to carry this out; and the ultimate cost would have to be borne either collectively by users of monkeys or the local government, whose financial commitments are already overstrained by providing for human priority needs.

On one occasion at least a reasonable compromise between the ideal and the expedient was provided by the Australian Government, who sent up a veterinary officer to arrange for bulk supplies for Australian use and chartered an aircraft to effect delivery of selected animals. What happened to those not selected I do not know.

The important points are, firstly, what proportion reach the laboratories out of the total caught in the jungles, and secondly, how soon can techniques be evolved when this distressing business can be rendered obsolete.

Yours faithfully,
R. A. WRIGHT.

Alciston Corner,
Nr. Polegate,
Sussex.
November 8th, 1959.

SCIENTIFIC

Histomoniasis and the Serum Proteins of the Turkey

Sir,—Electrophoretic studies of the host serum proteins have been carried out in only a small number of parasitic infections of veterinary importance. This report deals briefly with changes occurring in the serum proteins of turkey poults suffering from histomoniasis (blackhead). The birds were kept protozoa-free until 6 weeks old when they were infected intra-rectally with *Histomonas meleagridis* from the ground-up caeca of a bird infected with *Heterakis gallinae* ova. Total serum proteins were estimated by the micro-Kjeldahl method as was the albumen fraction after precipitation of the globulins by 22 per cent. sodium sulphate. Small-scale electrophoresis of serum was carried out on cellulose acetate, stained with Ponceau S. or nigrosin and "scanned" with a reflectance densitometer (Joyce, Loebl & Co. Ltd.). The globulin fractions were estimated by weighing the portion of the curve corresponding to each fraction.

The absolute albumen and globulin values in the serum of 6 control birds maintained protozoa-free and 6 birds of the same hatch infected 11 days previously showed that though the total protein was not significantly altered the albumen fraction was decreased and the globulin increased, causing a marked reversal of the A/G ratio (Table I). Analysis of the changes in the components of the globulin fractions showed that there was a great increase in the gamma component and slight increases in the other components (Table II). A representative density curve of one bird from each group is shown in Fig. 1.

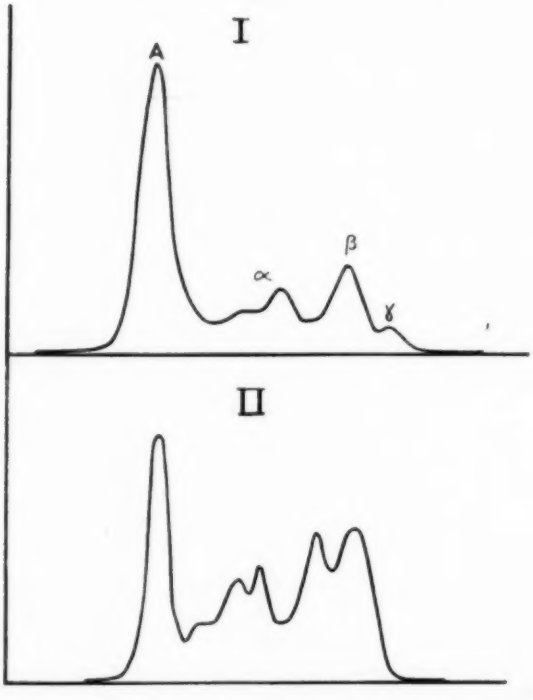

FIG. 1.—Scanned electrophoretogram of 7-week-old control poult (I) and poult infected intra-rectally with *Histomonas meleagridis* 11 days previously (II).

TABLE I
SERUM PROTEIN ANALYSIS OF 6 CONTROL BIRDS AND 6 INFECTED INTRA-RECTALLY WITH *Histomonas meleagridis* 11 DAYS PREVIOUSLY

	Serum protein			
	Total gm/100 ml.	Albumen gm/100 ml.	Globulin gm/100 ml.	Albumen: Globulin ratio
Control	3·41±0·28	2·36±0·26	1·04±0·08	2·27±0·2
Infected	3·20±0·42	1·33±0·04	1·87±0·35	0·71±0·04

Work is at present in progress to elucidate the factors responsible for these changes including liver and kidney function tests and immunological studies. Preliminary results suggest that the decreased albumen is not entirely associated with macroscopic liver lesions.

TABLE II
COMPARISON OF THE COMPONENTS OF THE GLOBULIN FRACTION OF 6 CONTROL BIRDS AND 6 INFECTED INTRA-RECTALLY WITH *Histomonas meleagridis*, 11 DAYS PREVIOUSLY

	Percentage dye uptake (Per cent.)		
	α	β	γ
Control ...	46·8±4·7	44·1±4·0	9·1±2·5
Infected ...	43·4±4·8	29·2±4·8	27·4±8·5
	Percentage dye uptake × globulin (gm./100 ml.)		
	α	β	γ
Control ...	0·49±0·05	0·46±0·06	0·09±0·03
Infected ...	0·81±0·17	0·54±0·08	0·52±0·22

Similar changes have been found in poults suffering from histomoniasis induced by *H. gallinae* ova and these are also being studied further.

Yours faithfully,
M. J. CLARKSON.

Liverpool School of Tropical Medicine and Faculty of Veterinary Science,
University of Liverpool.
November 2nd, 1959.